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TITLE: ALIGNING MECHANISM FOR REVOLVER

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide a revolver aligning mechanism capable of easily executing adjusting work at a low cost.

SOLUTION: The revolver aligning mechanism is provided with plural objective lens-fitting franges 14 arranged on the same circumference around the rotational axis of a revolver body 13 and capable of fitting objective lenses, ring-like springs 22 arranged on the inside of respective franges 14 to energize respective franges 14 to the outside, and position adjusting mechanisms 15 capable of adjusting the positions of respective franges 14 while pressing each frange 14 in the reverse direction and orthogonal direction of the energizing direction of its corresponding spring 22 on the opposite side to the spring 22 interposing each objective lens.

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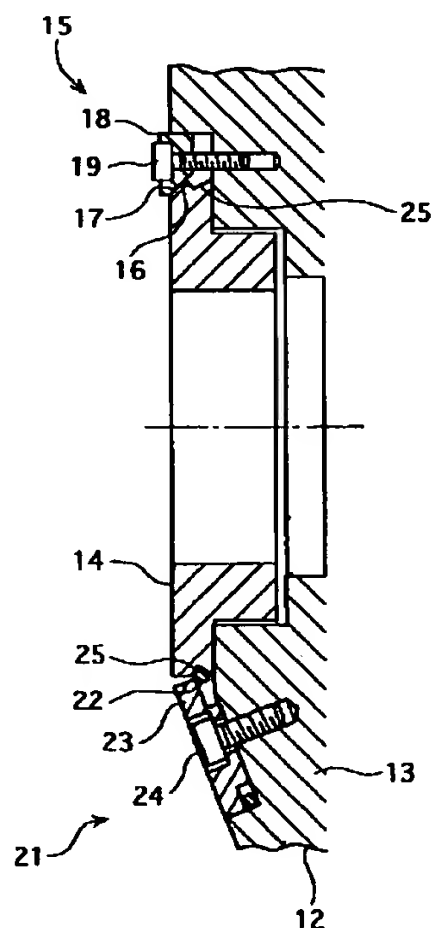
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(54)【発明の名称】 レボルバの調心機構

(57)【要約】

【課題】 コストを抑えつつ、調整作業が容易にできるレボルバの調心機構を提供する。

【解決手段】 レボルバ本体13の回転軸線を中心とする同一円周上に配置されそれぞれ対物レンズを取付可能な複数の対物レンズ取付フランジ14と、これら複数の対物レンズ取付フランジ14が配置された内側に配置されそれぞれの対物レンズ取付フランジ14を外側へ向かって付勢するリング状ばね22と、このリング状ばねとは各対物レンズを挟んで反対側において、各対物レンズ取付フランジ14を前記リング状ばねの付勢方向に対して反対方向および直交方向へ押圧しながら位置調整する位置調整機構15とを備える。



【特許請求の範囲】

【請求項1】 回転可能なレボルバ本体に複数の対物レンズをその回転軸線を中心とする同一円周上に取り付けたレボルバの調心機構において、

前記レボルバ本体の回転軸線を中心とする同一円周上に配置されそれぞれ対物レンズを取付可能な複数の対物レンズ取付部材と、

これら複数の対物レンズ取付部材が配置された内側に配置されそれぞれの対物レンズ取付部材を外側へ向かって付勢する付勢部材と、

この付勢部材とは各対物レンズを挟んで反対側において、各対物レンズ取付部材を前記付勢部材の付勢方向に対して反対方向および直交方向へ押圧しながら位置調整する位置調整機構とを備えたことを特徴とするレボルバの調心機構。

【請求項2】 請求項1に記載のレボルバの調心機構において、前記付勢部材は、リング状ばねによって構成されていることを特徴とするレボルバの調心機構。

【請求項3】 請求項2に記載のレボルバの調心機構において、前記対物レンズ取付部材の外周には、前記リング状ばねに係合する係合溝が形成されていることを特徴とするレボルバの調心機構。

【請求項4】 請求項1～請求項3のいずれかに記載のレボルバの調心機構において、前記位置調整機構は、前記対物レンズ取付部材の外周に形成された第1傾斜面と、この第1傾斜面に係合する第2傾斜面を有する押圧部材と、この押圧部材を前記対物レンズの光軸と平行な方向へ押圧しながら対物レンズ取付部材を位置調整する調整ねじとを含んで構成され、前記付勢部材が接する前記対物レンズ取付部材の外周位置を基準としてその対物レンズ取付部材の外周120度間隔位置にそれぞれ設けられていることを特徴とするレボルバの調心機構。

【請求項5】 請求項1～請求項4のいずれかに記載のレボルバの調心機構において、前記対物レンズ取付部材をレボルバ本体に固定する固定手段を備えていることを特徴とするレボルバの調心機構。

【請求項6】 請求項1～請求項5のいずれかに記載のレボルバの調心機構において、前記各対物レンズの焦点方向の位置を調整する焦点調整機構を備えていることを特徴とするレボルバの調心機構。

【請求項7】 請求項6に記載のレボルバの調心機構において、前記焦点調整機構は、前記対物レンズ取付部材に螺合されかつ内部に前記対物レンズを螺合した第1ナット部材と、この第1ナット部材の外周に螺合されその第1ナット部材との間で前記対物レンズを締め付け固定する第2ナット部材とを備えることを特徴とするレボルバの調心機構。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、レボルバの調心機

構に関する。詳しくは、顕微鏡などの光学機器に複数の対物レンズを切り換え可能に取り付けるためのレボルバに係り、とくに、対物レンズの調心機構に関する。

【0002】

【背景技術】 近年、たとえば、半導体の高集積化、ビデオヘッドなどの微細加工に代表されるように、ミクロからサブミクロンへの部品検査のニーズが急速に高まるとともに、たとえば、顕微鏡による検査の精度も飛躍的に向上している。

10 【0003】 図1は、部品検査などに使用される一般的な顕微鏡である。この顕微鏡1は、本体2を備える。本体2には、被検査物を取り付けるステージ3が設けられているとともに、顕微鏡ユニット4が上下（Z軸）方向へ移動自在に設けられている。顕微鏡ユニット4には、接眼レンズ5が取り付けられているとともに、複数本の対物レンズ6のいずれかがレボルバ7によって所定位置に割り出し可能に設けられている。

20 【0004】 ところで、顕微鏡1において、高精度の検査結果を得るためには、顕微鏡ユニット4側の光軸P1と対物レンズ6の光軸P2との一致は不可欠である。何故なら、これらの光軸P1、P2が一致していないと、レボルバ7を回して対物レンズ6を切り換えた際、観察している像が視野の中心からずれてしまう原因になるからである。

30 【0005】 しかし、対物レンズ6がレボルバ7を介して顕微鏡ユニット4側に取り付けられる形式の顕微鏡にあつては、両者が別体なのでそれぞれの光軸P1、P2を一致させることが困難である。つまり、各対物レンズ6単体でも、対物レンズの外径に対して光軸中心のずれ（誤差）があるうえ、レボルバ7の対物レンズ取付部にも光軸中心とのずれ（誤差）があるため、光軸P1、P2を一致させることが困難である。

40 【0006】 そこで、本出願人は、先に、この対策として、レボルバの調心機構（実開平6-78916号公報参照）を提案している。これは、図6および図7に示すように、固定部材11とこれに対して回転可能な可動部材12とからレボルバ本体13を構成するとともに、可動部材12の回転軸線を中心とする同一円周上に対物レンズ6を取付可能な複数の対物レンズ取付フランジ14を配置し、各対物レンズ取付フランジ14の外周120度間隔位置に位置調整機構15をそれぞれ設け、この3つの位置調整機構15によって対物レンズ取付フランジ14を対物レンズ6の光軸に対して直交する方向へ位置調整できるようにした構造である。

50 【0007】 位置調整機構15は、図8に示すように、対物レンズ取付フランジ14の外周120度間隔位置に第1傾斜面16を形成するとともに、この第1傾斜面16に係合する第2傾斜面17を有する調整カラー18をレボルバ本体13の可動部材12に調整ねじ19を介して取り付けした構造で、調整ねじ19の螺合により調整カ

ラー18を矢印A方向へスライドさせると、第1および第2傾斜面16、17の作用によって対物レンズ取付フランジ14が移動される構成である。

【0008】

【発明が解決しようとする課題】ところが、従来の調心機構では、各対物レンズ取付フランジ14を調整するための位置調整機構15のうち、内側の位置調整機構15がレボルバ本体13の中心部分に集中配置される関係から、対物レンズ取付フランジ14に対物レンズ6を取り付けると、調整ねじ19の締め付け緩め作業が困難になるという課題があった。

【0009】しかも、各対物レンズ取付フランジ14に3つの第1傾斜面16を加工しなければならないうえ、これに対応して3つの調整カラー18が必要なため、製造コストが高くつくという課題もある。

【0010】本発明の目的は、このような従来の課題を解消し、コストを抑えつつ、調整作業が容易にできるレボルバの調心機構を提供することにある。

【0011】

【課題を解決するための手段】本発明のレボルバの調心機構は、回転可能なレボルバ本体に複数の対物レンズをその回転軸線を中心とする同一円周上に取り付けたレボルバの調心機構において、前記レボルバ本体の回転軸線を中心とする同一円周上に配置されそれぞれ対物レンズを取付可能な複数の対物レンズ取付部材と、これら複数の対物レンズ取付部材が配置された内側に配置されそれぞれの対物レンズ取付部材を外側へ向かって付勢する付勢部材と、この付勢部材とは各対物レンズを挟んで反対側において、各対物レンズ取付部材を前記付勢部材の付勢方向に対して反対方向および直交方向へ押圧しながら位置調整する位置調整機構とを備えたことを特徴とする。

【0012】このような構成によれば、付勢部材によって、各対物レンズはそれぞれ外側へ向かって付勢されているから、各対物レンズを挟んで付勢部材とは反対側の位置調整機構によって、対物レンズ取付部材を付勢部材の付勢方向に対して反対方向および直交方向へ位置調整することができる。従って、複数の対物レンズ取付部材が配置された内側では調整作業を行わなくてもよいから、調整作業を容易に行うことができる。しかも、付勢部材は、単に対物レンズ取付部材を外側へ向かって付勢するだけでよいから、従来の構造（対物レンズ取付フランジに第1傾斜面を形成し、これに係合する第2傾斜面を有する調整カラーを調整ねじを介して設けた構造）に比べ、構造的にも簡易にできる。

【0013】以上において、前記付勢部材としては、それぞれの対物レンズ取付部材を外側へ向かって付勢できるものであればいずれでもよいが、リング状ばねによって構成するのが好ましい。これによれば、複数の対物レンズ取付部材に共通して1本のリング状ばねでよいから、コストをより低減できる。この際、対物レンズ取付部材の外周にリング状ばねに係合する係合溝を形成しておけば、リング状ばねが対物レンズ取付部材から外れることがないから、リング状ばねの付勢力を対物レンズ取付部材に確実に伝達できる。

【0014】前記位置調整機構は、前記対物レンズ取付部材の外周に形成された第1傾斜面と、この第1傾斜面に係合する第2傾斜面を有する押圧部材と、この押圧部材を前記対物レンズの光軸と平行な方向へ押圧しながら対物レンズ取付部材を位置調整する調整ねじとを含んで構成され、前記付勢部材が接する前記対物レンズ取付部材の外周位置を基準としてその対物レンズ取付部材の外周120度間隔位置にそれぞれ設けられている構成が好ましい。

【0015】また、上記構成において、前記対物レンズ取付部材をレボルバ本体に固定する固定手段を備えていることが好ましい。固定手段としては、なんでもよいが、止めねじなどでよい。固定手段を設けておけば、付勢手段の付勢力が小さくてもよいから、位置調整機構の調整作業を容易に行える。ちなみに、固定手段がない場合には、付勢手段の付勢力を大きくして、対物レンズ取付部材をレボルバ本体に対してずれが生じないように保持する必要があるが、そうすると、位置調整機構の調整作業が困難になる。

【0016】また、上記構成において、前記各対物レンズの焦点方向の位置を調整する焦点調整機構を備えていることが好ましい。焦点調整機構としては、前記対物レンズ取付部材に螺合されかつ内部に前記対物レンズを螺合した第1ナット部材と、この第1ナット部材の外周に螺合されその第1ナット部材との間で前記対物レンズを締め付け固定する第2ナット部材とを備える構成が好ましい。

【0017】この構成によれば、第2ナット部材を緩め、この状態において、第1ナット部材に螺合された対物レンズを回してピント合わせを行ったのち、第2ナット部材を締め付ける。これにより、各対物レンズ毎にピント合わせをすることができ、使用者がレボルバの切り換えにより対物レンズを切り換えて観察する際のピント合わせ操作を少なくすることができる。

【0018】

【発明の実施の形態】以下、本発明のレボルバの調心機構にかかる実施形態を図面に基づいて説明する。なお、以下の説明にあたって、前記図6～図8と同一構成要件については、同一符号を付し、その説明を省略もしくは簡略化する。

【0019】本実施形態におけるレボルバの調心機構は、図2および図3に示すように、対物レンズ取付部材としての対物レンズ取付フランジ14に配置された3つの位置調整機構15のうち内側の位置調整機構15が省略され、これに代わって、複数の対物レンズ取付フラン

ジ14をそれぞれ外側へ向かって付勢する付勢手段21と、各対物レンズ取付フランジ14をレボルバ本体13（可動部材12）に固定する固定手段31とが設けられている点が、従来（図6および図7）のものと異なる。

【0020】付勢手段21は、図4に示すように、それぞれの対物レンズ取付フランジ14を外側へ向かって付勢する一部開放（リングの一部が切れている）のリング状ばね22と、このリング状ばね22を可動部材12の回転中心位置に保持する保持部材23と、この保持部材23を可動部材12の回転中心位置に固定する止めねじ24とから構成されている。一方、リング状ばね22が当接する対物レンズ取付フランジ14の外周には、リング状ばね22に係合する環状の係合溝25が形成されている。

【0021】固定手段31は、各対物レンズ取付フランジ14の位置調整機構15よりやや内側位置において、対物レンズ取付フランジ14を通して可動部材12に螺合され、対物レンズ取付フランジ14を可動部材12に固定する締付ねじ32によって構成されている。

【0022】なお、位置調整機構15については、図8の構造と同じである。つまり、対物レンズ取付フランジ14の外周に対物レンズの光軸に対して傾斜状に形成された第1傾斜面16と、この第1傾斜面16に係合する第2傾斜面17を有する押圧部材としての調整カラー18と、この調整カラー18を前記対物レンズ6の光軸と平行な方向へ押圧しながら対物レンズ取付フランジ14を位置調整する調整ねじ19とを備えた構成で、リング状ばね22が接する対物レンズ取付フランジ14の外周位置を基準として、その対物レンズ取付フランジ14の外周120度間隔位置にそれぞれ配置されている。

【0023】従って、本実施形態によれば、リング状ばね22によって、各対物レンズ取付フランジ14はそれぞれ外側へ向かって付勢されているから、それとは反対側の位置調整機構15において調整作業を行うと、対物レンズ取付フランジ14が対物レンズの光軸に対して直交する方向へ移動される。このことは、複数の対物レンズ取付フランジ14が配置された内側では、調整作業を行わなくてもよいから、調整作業を容易に行うことができる。

【0024】また、各対物レンズ取付フランジ14をそれぞれ外側へ向かって付勢する部材として、リング状ばね22を用いたので、簡単な構成のうえ、複数の対物レンズ取付フランジ14に共通して1本のリング状ばねでよいから、コストをより低減できる。しかも、対物レンズ取付フランジ14の外周にリング状ばね22に係合する係合溝25を形成したので、リング状ばね22が対物レンズ取付フランジ14から外れることがない。従って、リング状ばね22の付勢力を対物レンズ取付フランジ14に確実に伝達できる。

【0025】また、位置調整機構15は、対物レンズ取

付フランジ14の外周に形成された第1傾斜面16と、この第1傾斜面16に係合する第2傾斜面17を有する調整カラー18と、この調整カラー18を対物レンズの光軸と平行な方向へ押圧しながら対物レンズ取付フランジ14を位置調整する調整ねじ19とを備えた構成であるから、調心作業を正確にかつ簡単に行うことができる。

【0026】また、対物レンズ取付フランジ14をレボルバ本体13に固定する固定手段31を設けたので、リング状ばね22の付勢力が小さいものを用いることができ、よって、位置調整機構15の調整作業を容易に行える。ちなみに、固定手段31がない場合には、リング状ばね22の付勢力を大きくして、対物レンズ取付フランジ14をレボルバ本体13に対してずれが生じないように保持する必要があるが、そうすると、位置調整機構15の調整作業が困難になる。

【0027】なお、上記実施形態において、各対物レンズ6の焦点方向の位置を調整する焦点調整機構を設けてもよい。たとえば、図5に示すような焦点調整機構41を設けてもよい。これは、対物レンズ取付フランジ14に螺合されかつ内部に前記対物レンズ6を螺合した第1ナット部材42と、この第1ナット部材42の外周に螺合されその第1ナット部材42との間で前記対物レンズ6の鍔部6Aを締め付け固定する第2ナット部材43とを備える構成である。なお、44は第2ナット部材43の外周に開けられた穴で、第2ナット部材43を回す際にピンなどを差し込んで回すためのものである。

【0028】このようにすると、第2ナット部材43を緩め、この状態において、第1ナット部材42に螺合された対物レンズ6を回してピント合わせを行ったのち、第2ナット部材43を締め付ける。これにより、各対物レンズ6毎にピント合わせすることができるから、使用者がレボルバ7の切り換えにより対物レンズ6を切り換えて観察する際のピント合わせ操作を少なくすることができる。

【0029】また、上記実施形態では、各対物レンズ取付フランジ14をそれぞれ外側へ向かって付勢する部材として、リング状ばね22を用いたが、各対物レンズ取付フランジ14毎に線または板ばねで付勢するようにしてもよい。さらに、ばねに限らず、弾性部材一般を用いてもよい。

【0030】また、上記実施形態では、位置調整機構15を、対物レンズ取付フランジ14の外周に形成された第1傾斜面16と、この第1傾斜面16に係合する第2傾斜面17を有する調整カラー18と、調整ねじ19とから構成したが、これに限らず、他の構成でもよい。要するに、各対物レンズ取付フランジ14をリング状ばね22の付勢方向に対して反対方向および直交方向へ押圧しながら位置調整できるものであれば、どのようなものでもよい。

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【0031】

【発明の効果】本発明のレボルバの調心機構によれば、複数の対物レンズ取付部材が配置された内側に、それぞれの対物レンズ取付部材を外側へ向かって付勢する付勢部材を配置したので、複数の対物レンズ取付部材が配置された内側では調整作業を行わなくてもよいから、調整作業を容易に行うことができる。しかも、付勢部材は、単に対物レンズ取付部材を外側へ向かって付勢するだけでよいから、従来の構造に比べ、構造的にも簡易にかつ安価にできる。

【図面の簡単な説明】

【図1】一般的な顕微鏡を示す全体図である。

【図2】本発明にかかるレボルバの調心機構を示す図である。

【図3】図2の III-III 線断面図である。

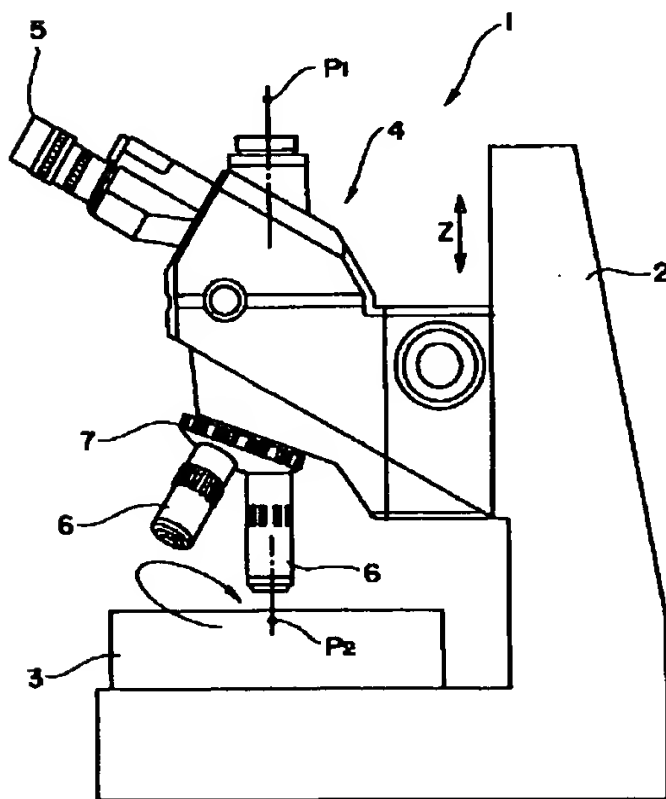
【図4】図3の一部を拡大した拡大図である。

【図5】本発明の他の実施形態を示す図である。

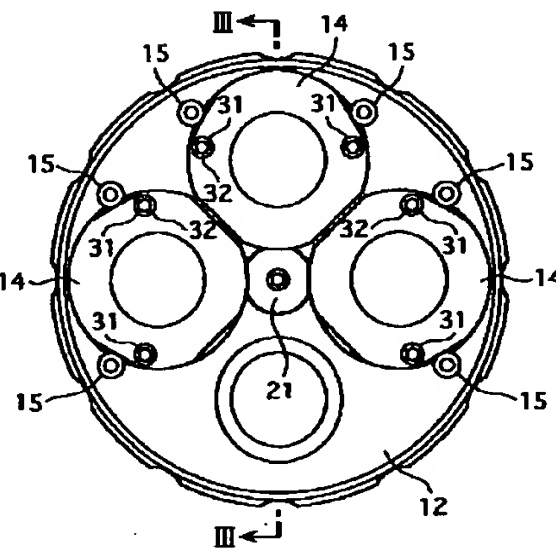
【図6】従来のレボルバを示す図である。

【図7】図6の VII-VII 線断面図である。

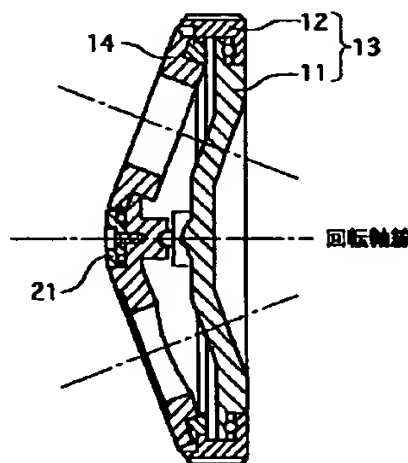
【図1】



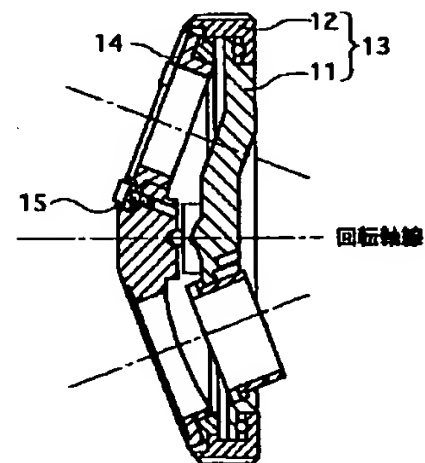
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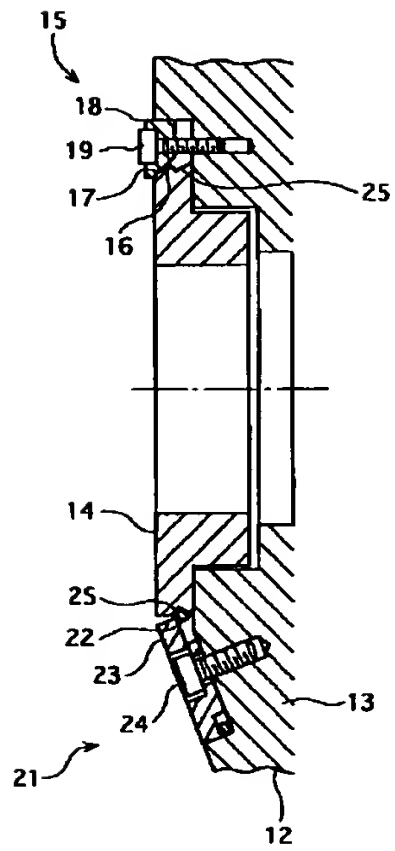
【図3】



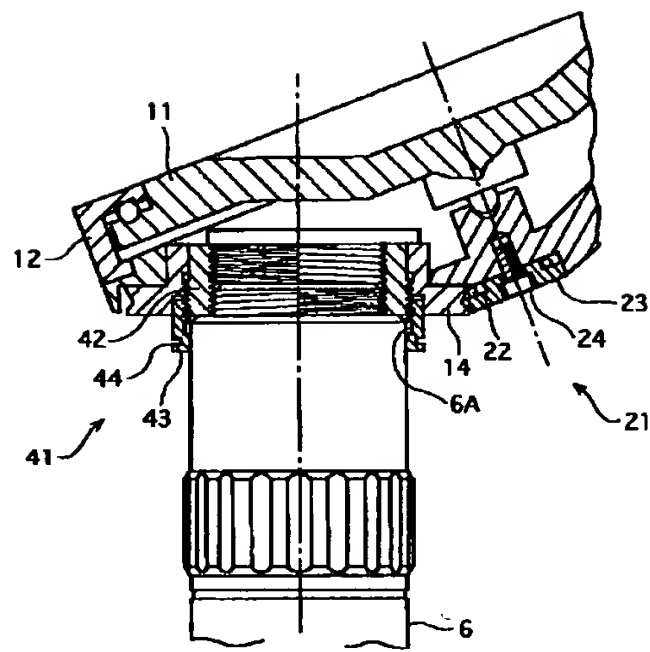
【図7】



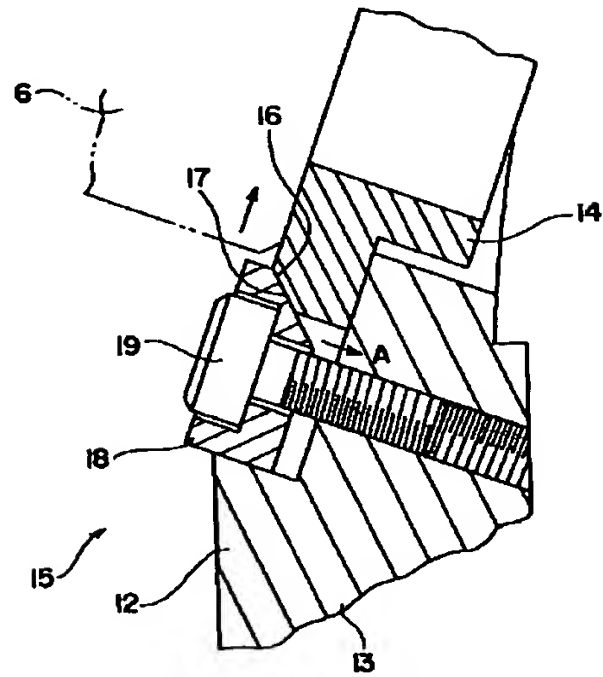
【図4】



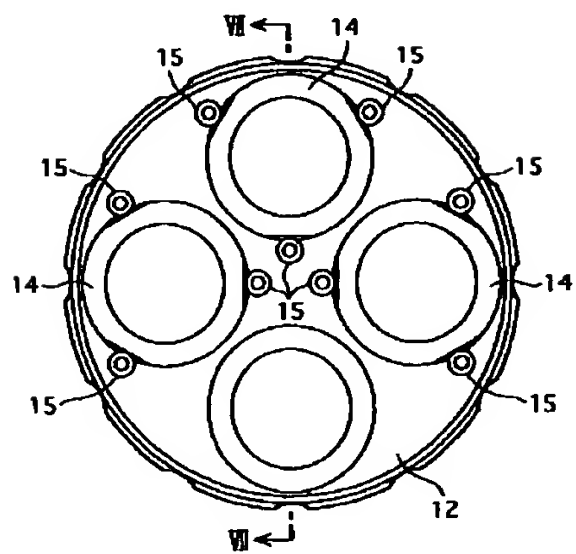
【図5】



【図8】



【図6】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the alignment device of a revolver. The revolver for attaching two or more objective lenses in optical instruments, such as a microscope, possible [a switch] in detail is started, and it is especially related with the alignment device of an objective lens

[0002]

[Background of the Invention] While the needs of the components inspection to submicron one increase quickly since micro so that it may be represented by micro processing, such as high integration of recent years, for example, a semi-conductor, and a video head, the precision of the inspection under a microscope is also improving by leaps and bounds, for example.

[0003] Drawing 1 is a common microscope used for components inspection etc. This microscope 1 is equipped with a body 2. While the stage 3 in which an inspected object is attached is formed, the microscope unit 4 is formed in the body 2 free [migration in the vertical (Z-axis) direction]. While the ocular 5 is attached, either of two or more objective lenses 6 is prepared in the predetermined location possible [indexing] by the revolver 7 at the microscope unit 4.

[0004] By the way, in a microscope 1, in order to obtain a highly precise inspection result, the coincidence with the optical axis P1 by the side of the microscope unit 4 and the optical axis P2 of an objective lens 6 is indispensable. When these optical axis P1 and P2 were not in agreement, a revolver 7 is turned and an objective lens 6 is switched, it is because the image currently observed becomes the cause which shifts from the core of a visual field.

[0005] However, if it is in the microscope of the format that an objective lens 6 is attached in the microscope unit 4 side through a revolver 7, since both are another objects, it is difficult to make in agreement each optical axis P1 and P2. That is, in each set object lens 6 simple substance's also having a gap (error) of an optical-axis core to the outer diameter of an objective lens, since there is a gap (error) with an optical-axis core also in the objective lens attachment section of a revolver 7, it is difficult to make in agreement optical axis P1 and P2.

[0006] Then, these people have proposed the alignment device (refer to JP,6-78916,U) of a revolver as this cure previously. As this shows drawing 6 and drawing 7, while constituting the revolver body 13 from pivotable moving-part material 12 to a holddown member 11 and this Two or more objective lens mounting flanges 14 which can attach an objective lens 6 on the same periphery centering on axis of rotation of the moving-part material 12 are arranged. It is the structure which forms the justification device 15 in the 120 periphery spacing location of each set object lens mounting flange 14, respectively, and enabled it to justify the objective lens mounting flange 14 according to these three justification devices 15 in the direction which intersects perpendicularly to the optical axis of an objective lens 6.

[0007] As shown in drawing 8, while the justification device 15 forms the 1st inclined plane 16 in the 120 periphery spacing location of the objective lens mounting flange 14 With the structure which attached in the moving-part material 12 of the revolver body 13 the adjustment color 18 which has the 2nd inclined plane 17 which engages with this 1st inclined plane 16 through the adjusting screw 19 When the adjustment color 18 is made to slide in the direction of arrow-head A by screwing of an adjusting screw 19, it is the configuration that the objective lens mounting flange 14 is moved by operation of the 1st and 2nd inclined planes 16 and 17.

[0008]

[Problem(s) to be Solved by the Invention] However, by the conventional alignment device, when the inside justification device 15 attached the objective lens 6 in a part for the core of the revolver body 13 from relation at the objective lens mounting flange 14 by which intensive arrangement is carried out among the justification devices 15 for adjusting each set object lens mounting flange 14, the technical problem that the bolting looser activity of an adjusting screw 19 became difficult occurred.

[0009] And corresponding to this, in having to process the 1st three inclined plane 16 into each set object lens mounting flange 14, since three adjustment colors 18 are required, the technical problem that a manufacturing cost costs dearly also occurs.

[0010] Tuning is to offer the alignment device of the revolver made easily, the purpose of this invention canceling such a conventional technical problem, and holding down cost.

[0011]

[Means for Solving the Problem] In the alignment device of a revolver in which two or more objective lenses were attached on the same periphery centering on the axis of rotation at the revolver body with the pivotable alignment device of the revolver of this invention It is arranged on the same periphery centering on axis of rotation of said revolver body. Two or more objective lens attachment members which can attach an objective lens, respectively, The energization member which is arranged at the inside by which the objective lens attachment member of these plurality has been arranged, and energizes each objective lens attachment member toward an outside, and this energization member are set to the opposite side on both sides of each set object lens. It is characterized by having the justification device justified while pressing each set object lens attachment member in an opposite direction and the rectangular direction to the energization direction of said energization member.

[0012] Since each set object lens is energized by the energization member toward the outside, respectively, according to such a configuration, it can justify an objective lens attachment member in an opposite direction and the rectangular direction to the energization direction of an energization member according to the justification device of the opposite side by it on both sides of each set object lens with an energization member. Therefore, in the inside two or more objective lens attachment members have been arranged, since it is not necessary to perform tuning, tuning can be performed easily. And since an energization member should just only energize an objective lens attachment member toward an outside, it is made structurally and simply compared with the conventional structure (structure which prepared the adjustment color which has the 2nd inclined plane which forms the 1st inclined plane in an objective lens mounting flange, and engages with this through the adjusting screw).

[0013] Although any are sufficient as long as it can energize each objective lens attachment member toward an outside as said energization member above, it is desirable that a ring-like spring constitutes. According to this, in common with two or more objective lens attachment members, since one ring-like spring is sufficient, cost can be reduced more. Under the present circumstances, if the engagement slot where a ring-like spring engages with the periphery of an objective lens attachment member is formed, since a ring-like spring does not separate from an objective lens attachment member, the energization force of a ring-like spring can be certainly transmitted to an objective lens attachment member.

[0014] The 1st inclined plane where said justification device was formed in the periphery of said objective lens attachment member, It is constituted including the press member which has this 1st inclined plane and the 2nd engaged inclined plane, and the adjusting screw which justifies an objective lens attachment member while pressing this press member in the direction parallel to the optical axis of said objective lens. The configuration prepared in the 120 periphery spacing location of the objective lens attachment member, respectively on the basis of the periphery location of said objective lens attachment member where said energization member touches is desirable.

[0015] Moreover, in the above-mentioned configuration, it is desirable to have a fixed means to fix said objective lens attachment member to a revolver body. As a fixed means, although it is good anything, it is good at a setscrew etc. If the fixed means is established, since the energization force of an energization means may be small, tuning of a justification device can be performed easily. Incidentally, when there is no fixed means, the energization force of an energization means is enlarged, it is necessary to hold but so that a gap may not produce an objective lens attachment member to a revolver body, and if it does so, the tuning of a justification device will become difficult.

[0016] Moreover, in the above-mentioned configuration, it is desirable to have the focus control device in which the location of the direction of a focus of said each set object lens is adjusted. A configuration equipped with the 1st nut member which was screwed in said objective lens attachment member, and screwed said objective lens in the interior as a focus control device, and the 2nd nut member which it is screwed in the periphery of this 1st nut member, and binds said objective lens tight and is fixed between that 1st nut member is desirable.

[0017] After according to this configuration loosening the 2nd nut member, turning the objective lens screwed in the 1st nut member in this condition and performing focus doubling, the 2nd nut member is bound tight.

Thereby, since focus doubling can be carried out for every each set object lens, focus doubling actuation at the time of a user switching an objective lens by switch of a revolver, and observing can be lessened.

[0018]

[Embodiment of the Invention] Hereafter, the operation gestalt concerning the alignment device of the revolver of this invention is explained based on a drawing. In addition, in the following explanation, about the requirements for the same configuration as said drawing 6 - drawing 8 , the same sign is attached, and the explanation is omitted or simplified.

[0019] As the alignment device of the revolver in this operation gestalt is shown in drawing 2 and drawing 3 . The inside justification device 15 is omitted among three justification devices 15 arranged at the objective lens mounting flange 14 as an objective lens attachment member. An energization means 21 to energize two or more objective lens mounting flanges 14 toward an outside instead of this, respectively, It differs from the thing of the former (drawing 6 and drawing 7) in that a fixed means 31 to fix each set object lens mounting flange 14 to the revolver body 13 (moving-part material 12) is established.

[0020] The energization means 21 consists of an attachment component 23 which energizes each objective lens mounting flange 14 toward an outside and which holds the ring-like spring 22 and this ring-like spring 22 of disconnection (some rings have run out) in the center-of-rotation location of the moving-part material 12 in part, and a setscrew 24 which fixes this attachment component 23 to the center-of-rotation location of the moving-part material 12, as shown in drawing 4 . On the other hand, the annular engagement slot 25 where the ring-like spring 22 is engaged is formed in the periphery of the objective lens mounting flange 14 which the ring-like spring 22 contacts.

[0021] A little, the fixed means 31 is screwed in the moving-part material 12 through the objective lens mounting flange 14 in an inside location, and is constituted from a justification device 15 of each set object lens mounting flange 14 by the clamping screw 32 which fixes the objective lens mounting flange 14 to the moving-part material 12.

[0022] In addition, about the justification device 15, it is the same as the structure of drawing 8 . That is, the 1st inclined plane 16 formed in the periphery of the objective lens mounting flange 14 in the shape of an inclination to the optical axis of an objective lens, The adjustment color 18 as a press member which has this 1st inclined plane 16 and the 2nd engaged inclined plane 17, With the configuration equipped with the adjusting screw 19 which justifies the objective lens mounting flange 14 while pressing this adjustment color 18 in the direction parallel to the optical axis of said objective lens 6 It is arranged in the 120 periphery spacing location of the objective lens mounting flange 14, respectively on the basis of the periphery location of the objective lens mounting flange 14 where the ring-like spring 22 touches.

[0023] Therefore, according to this operation gestalt, with it, since it is energized toward the outside, respectively, each set object lens mounting flange 14 will be moved in the direction where the objective lens mounting flange 14 intersects perpendicularly to the optical axis of an objective lens by the ring-like spring 22, if tuning is performed in the justification device 15 of the opposite side. In the inside two or more objective lens mounting flanges 14 have been arranged, since this does not need to perform tuning, it can perform tuning easily.

[0024] Moreover, as a member which energizes each set object lens mounting flange 14 toward an outside, respectively, since the ring-like spring 22 was used, since one ring-like spring is sufficient, in common with two or more objective lens mounting flanges 14, cost can be reduced more after an easy configuration. And since the engagement slot 25 where the ring-like spring 22 engages with the periphery of the objective lens mounting flange 14 was formed, the ring-like spring 22 does not separate from the objective lens mounting flange 14. Therefore, the energization force of the ring-like spring 22 can be certainly transmitted to the objective lens mounting flange 14.

[0025] Moreover, since the justification device 15 is the configuration equipped with the adjusting screw 19 which justifies the objective lens mounting flange 14, pressing the adjustment color 18 which has the 1st inclined plane 16 formed in the periphery of the objective lens mounting flange 14, and this 1st inclined plane 16 and the 2nd engaged inclined plane 17, and this adjustment color 18 in the direction parallel to the optical axis of an objective lens, it can do an alignment activity correctly and easily.

[0026] Moreover, since a fixed means 31 to fix the objective lens mounting flange 14 to the revolver body 13 was established, the energization force of the ring-like spring 22 can use a small thing, and, therefore, can perform tuning of the justification device 15 easily. Incidentally, when there is no fixed means 31, the energization force of the ring-like spring 22 is enlarged, it is necessary to hold but so that a gap may not produce the objective lens mounting flange 14 to the revolver body 13, and if it does so, the tuning of the justification device 15 will become difficult.

[0027] In addition, in the above-mentioned operation gestalt, the focus control device in which the location of the direction of a focus of each set object lens 6 is adjusted may be established. For example, the focus control device 41 as shown in drawing 5 may be established. This is a configuration equipped with the 1st nut member 42 which was screwed in the objective lens mounting flange 14, and screwed said objective lens 6 in the interior, and the 2nd nut member 43 which it is screwed in the periphery of this 1st nut member 42, and binds flange 6A of said objective lens 6 tight, and is fixed between that 1st nut member 42. In addition, 44 is the hole which was able to be made in the periphery of the 2nd nut member 43, and in case it turns the 2nd nut member 43, it is for inserting and turning a pin etc.

[0028] If it does in this way, after loosening the 2nd nut member 43, turning the objective lens 6 screwed in the 1st nut member 42 in this condition and performing focus doubling, the 2nd nut member 43 is bound tight. Thereby, since focus doubling can be carried out every each set object lens 6, focus doubling actuation at the time of a user switching an objective lens 6 by switch of a revolver 7, and observing can be lessened.

[0029] Moreover, although the ring-like spring 22 was used, you may make it energize by the line or flat spring every each set object lens mounting flange 14 with the above-mentioned operation gestalt as a member which energizes each set object lens mounting flange 14 toward an outside, respectively. Furthermore, not only a spring but a general elastic member may be used.

[0030] Moreover, although the above-mentioned operation gestalt constituted from the adjustment color 18 which has the 1st inclined plane 16 formed in the periphery of the objective lens mounting flange 14 in the justification device 15, and this 1st inclined plane 16 and the 2nd engaged inclined plane 17, and the adjusting screw 19, not only this but other configurations may be used. As long as it can justify in short, pressing each set object lens mounting flange 14 in an opposite direction and the rectangular direction to the energization direction of the ring-like spring 22, what kind of thing may be used.

[0031]

[Effect of the Invention] Since the energization member which energizes each objective lens attachment member toward an outside to the inside by which two or more objective lens attachment members have been arranged has been arranged according to the alignment device of the revolver of this invention, since it is not necessary to perform tuning, by the inside two or more objective lens attachment members have been arranged, tuning can be performed easily. And since an energization member should just only energize an objective lens attachment member toward an outside, it is made structurally, simply, and cheaply compared with the conventional structure.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the general drawing showing a common microscope.

[Drawing 2] It is drawing showing the alignment device of the revolver concerning this invention.

[Drawing 3] Drawing 2 III-III It is a line sectional view.

[Drawing 4] It is the enlarged drawing to which a part of drawing 3 was expanded.

[Drawing 5] It is drawing showing other operation gestalten of this invention.

[Drawing 6] It is drawing showing the conventional revolver.

[Drawing 7] Drawing 6 VII-VII It is a line sectional view.

[Drawing 8] It is the sectional view showing the justification device in the conventional revolver.

[Description of Notations]

6 Objective Lens

7 Revolver

13 Revolver Body

14 Objective Lens Mounting Flange (Objective Lens Attachment Member)

15 Justification Device

16 1st Inclined Plane

17 2nd Inclined Plane

18 Adjustment Color (Press Member)

19 Adjusting Screw

22 Ring-like Spring (Energization Member)

25 Engagement Slot

31 Fixed Means

41 Focus Control Device

42 1st Nut Member

43 2nd Nut Member

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CLAIMS

[Claim(s)]

[Claim 1] In the alignment device of a revolver in which two or more objective lenses were attached on the same periphery centering on the axis of rotation at the pivotable revolver body It is arranged on the same periphery centering on axis of rotation of said revolver body. Two or more objective lens attachment members which can attach an objective lens, respectively, The energization member which is arranged at the inside by which the objective lens attachment member of these plurality has been arranged, and energizes each objective lens attachment member toward an outside, and this energization member are set to the opposite side on both sides of each set object lens. The alignment device of the revolver characterized by having the justification device justified while pressing each set object lens attachment member in an opposite direction and the rectangular direction to the energization direction of said energization member.

[Claim 2] It is the alignment device of the revolver characterized by constituting said energization member with the ring-like spring in the alignment device of a revolver according to claim 1.

[Claim 3] The alignment device of the revolver characterized by forming in the periphery of said objective lens attachment member the engagement slot where said ring-like spring is engaged in the alignment device of a revolver according to claim 2.

[Claim 4] In the alignment device of a revolver according to claim 1 to 3 said justification device The press member which has the 1st inclined plane formed in the periphery of said objective lens attachment member, and this 1st inclined plane and the 2nd engaged inclined plane, It is constituted including the adjusting screw which justifies an objective lens attachment member while pressing this press member in the direction parallel to the optical axis of said objective lens. The alignment device of the revolver characterized by being prepared in the 120 periphery spacing location of the objective lens attachment member, respectively on the basis of the periphery location of said objective lens attachment member where said energization member touches.

[Claim 5] The alignment device of the revolver characterized by having a fixed means to fix said objective lens attachment member to a revolver body, in the alignment device of a revolver according to claim 1 to 4.

[Claim 6] The alignment device of the revolver characterized by having the focus control device in which the location of the direction of a focus of said each set object lens is adjusted, in the alignment device of a revolver according to claim 1 to 5.

[Claim 7] It is the alignment device of the revolver characterized by having the 2nd nut member which is screwed in the periphery of the 1st nut member which said focus control device was screwed in said objective lens attachment member, and screwed said objective lens in the interior, and this 1st nut member, binds said objective lens tight between that 1st nut member in the alignment device of a revolver according to claim 6, and is fixed.

[Translation done.]